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A Small Dusting Machine in Operation

DUSTING EXPERIMENTS IN PEACH AND APPLE ORCHARDS

By

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CONCLUSIONS

These conclusions are based on the results of the experiments detailed in this bulletin supplemented by such data from other experimental work as are applicable to Virginia conditions. A detailed statement of these results is found in the separate summaries under peach and apple dusting experiments.

Peaches

Dusting mixtures which contain sulfur and arsenate of lead, with or without the addition of a filler have given satisfactory control of peach scab and curculio, and may be used if desired for the first two summer applications.

These materials, however, did not prove satisfactory in the control of brown rot and therefore should not be relied on for the third or subsequent summer application.

Apples

Dusting mixtures containing arsenate of lead as the insecticide have given satisfactory control of codling moth.

Bordeaux dust gave especially satisfactory control of blotch and leaf spots in these experiments.

Bordeaux dust and sulfur dust mixtures were practically worthless in the control of bitter rot in these experiments and neither should be used for this purpose.

No data on scab control were obtained in this work but other investigations have shown the uncertainty of satisfactory control with such dusting materials as have been employed.

Dusting Experiments in Peach and Apple Orchards

By F. D. FROMME, *Plant Pathologist*, and
G. S. RALSTON, *Field Horticulturist.*

The use of fungicides and insecticides in the dry or dust forms as a means of combatting diseases and insect pests in commercial orchards has attracted much attention in recent years. The promise of greater ease and efficiency of application and the saving of time and labor during rush periods has led a number of Virginia orchardists to purchase dusting outfits. These have come into use more especially for the first codling moth application in the larger orchards or where rough ground hampers the use of the heavier liquid outfits, and to a more limited extent in peach orchards.

The demands for information from these persons and from others contemplating the installation of dusting equipment led to the establishment of the experimental work presented in this bulletin.

The experiments were carried out during the season of 1919 and were planned to determine the efficiency of the dust form of application in the control of the common diseases and insects of Virginia apple and peach orchards exclusive of those which are controlled by dormant applications. No particular effort was made to compare the economy of the dust and liquid applications.

While this report is based on only a single season's experience, the results are decisive and indicate clearly some of the limitations of dusting for general orchard practice. It is believed that these results should be made available to the fruit growers at once.

Materials and Equipment

The texture of dusting materials has been improved greatly in recent years. These materials are now much finer and are available in greater variety. In general two types are offered to the peach grower. One containing lead arsenate and sulfur, and the other containing these substances with an additional substance used as a filler.

The following formulas were used on peaches in this investigation:—

90-10, containing 90 parts (by weight) sulfur and 10 parts lead arsenate.

50-40-10, containing 50 parts sulfur, 40 parts filler and 10 parts lead arsenate.

A Bordeaux dusting mixture and an 80-10-10 mixture (80 parts sulfur, 10 parts filler and 10 parts lead arsenate) were used on apples.

A small Johnson duster was used in one of the peach orchards and a larger machine of the same make in the other. A large size Niagara duster[1] was used in both apple orchards. All these machines did satisfactory work The rate of application with the larger machines was determined by the speed with which they could be hauled. In fact the flow of dust had to be stopped at times to prevent waste of materials. There was no difficulty in applying dust to the highest parts of the trees. The dust was applied from both sides as is practiced in spraying. This is the only way to secure efficient dusting in our experience, especially when the trees are large. The quantity of materials used was greater than that generally advocated. The application on peaches was approximately three-fourths of a pound of the 90-10 formula per tree, and two-fifths of a pound of the 50-40-10 formula. The latter mixture which contains filler apparently did not feed as fast as the former. The trees are nine years old and of very good size in both orchards.

The rate of application in the Pippin orchard was three pounds per tree. The trees are very large and it required from eight to ten gallons of liquid per tree to spray them thoroughly. The Ben Davis trees are smaller than the Pippin and consequently less material was used.

The cost of application was high with the dusting materials at the present prices. There was no attempt, however, to use the smallest amount of dust consistent with efficient control, yet undue waste was avoided.

EXPERIMENTS IN PEACH ORCHARDS

The B. F. Moomaw orchard at Cloverdale, Va., and the C. E. Blue orchard near Charlottesville, Va., were kindly placed at our disposal for this investigation.[2] These orchards are representative of the better cared for peach orchards of the state and include several of the more common commercial varieties.

Experiments in Moomaw Orchard

This location is a well elevated site with especially good air drainage. The orchard has borne crops of very good fruit for five or six years. It has been well cultivated and fertilized, and has received the regulation spray treatment as recommended for this State. This spray treatment has always given good results, practically no fruit being discarded on account of disease and insect injury.

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[1]The Niagara duster was kindly loaned by the Niagara Sprayer Company.

[2]To Mrs. Minnie W. Gentry, Mr. B. F. Moomaw, Mr. C. E. Blue and Mr. Tucker Gentry, the authors wish to express their appreciation of many courtesies extended them and their thanks for co-operation and assistance.

A block of trees 57 rows long and 14 rows wide, including four varieties was selected on the side of the orchard next to the prevailing winds. The plats were laid out crosswise to the variety rows so that approximately the same number of trees of each variety was included in each plat, or 228 trees in all, with the exception of the check plat, which was located on the outside of the orchard and contained 114 trees.

A very heavy crop of peaches was borne in this orchard in 1918, and while the bloom was heavy in 1919, the cold weather limited the crop to two varieties, Carman and Belle, although Elberta and White Heath were included in the plats. The treatment was as follows:—

Plat 1—Check.

Plat 2—90-10 formula, applied March 23, May 14, and June 18.

Plat 3—50-40-10 formula, applied March 23, May 14, and June 18.

Plat 4—50-40-10 formula, applied March 23, May 14, June 18, and July 3.[3]

The dust applications in plats 2 and 3 parallel those of the liquid applications as recommended by the Station, and as practiced by the orchardists of these sections. The fourth application on plat 4 was applied as an extra precaution in case of adverse weather conditions.

At harvest the fruit was graded into four classes, sound, scab[4], rot and wormy as shown in table 1. All fruits showing any scab lesions were recorded under scab, and the same rule was followed with brown rot. All peaches marked in any way by curculio were recorded under the head of wormy without regard to the presence of the larvæ in the fruit. For this reason a number of marketable peaches were included here. From the commercial standpoint the curculio injury on all plats was of no importance. Many of the peaches were marked by hail and by the attack of the green soldier bug.

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[3]The application of March 23 on this plat was made with a mixture of 10 parts lead arsenate and 90 parts hydrated lime. This was also true of the first application on plat 4 in the Blue orchard. The infestation of curculio was so slight that a thorough test of the efficiency of this mixture was not obtained, but it was seemingly as satisfactory as the mixture which contained sulfur.

[4]The technical names of the fungi causing the diseases referred to in this bulletin are as follows: peach scab, *Cladosporium carpophilum*; brown rot, *Sclerotinia cinerea*; blotch, *Phyllosticta solitaria*; bitter rot, *Glomerella cingulata*; frog-eye leaf spot, *Sphaeropsis malorum*.

TABLE 1.—*Yields of peaches from dusting experiment in Moomaw orchard*

Variety	plat	total peaches examined	number of fruits				per cent of fruits			
			sound	scab	rot	wormy	sound	scab	rot	wormy
Belle	1	504	347	133	9	15	68.8	26.4	1.8	3.0
	2	763	706	9	8	40	92.5	1.2	1.1	5.2
	3	1950	1896	21	3	30	97.2	1.1	0.2	1.5
	4	1363	1291	29	11	32	94.7	2.1	0.8	2.4
Carman	1	1225	400	705	45	75	32.6	57.5	3.7	6.2
	2	5109	4936	13	46	114	96.6	0.3	0.9	2.2
	3	5618	5390	7	111	110	95.9	0.1	2.0	2.0
	4	4061	3884	6	96	75	95.7	0.1	2.4	1.8

TABLE 2.—*Summary of dusting experiment in the Moomaw orchard. (The figures show percentage of infection.)*

Plat	Treatment	Belle			Carman		
		scab	rot	wormy	scab	rot	wormy
1	check	26.4	1.8	3.0	57.5	3.7	6.2
2	90-10 dust 3 applications	1.2	1.1	5.2	0.3	0.9	2.2
3	50-40-10 dust 3 applications	1.1	0.2	1.5	0.1	2.0	2.0
4	50-40-10 dust 4 applications	2.1	0.8	2.4	0.1	2.4	1.8

Reference to tables 1 and 2 shows a very striking and satisfactory control of scab on all plats receiving dust applications. None of the fruits on these plats was affected enough to render it unfit for the first grade, and the infection consisted in most cases of only one or two small spots. This combined with the low percentage of infection, which varied from 1 to 2 per cent on Belle and less than 1 per cent on Carman, is considered a very satisfactory showing for the dust treatment. The percentage of scab in the check plats was high, 26 per cent of the Belle and 57 per cent of the Carman being infected. The difference in the severity of the infection was also marked. A large part of the scabby peaches from the check plats were badly dwarfed and split, few being so lightly infected that they could be marketed.

The results with brown rot are inconclusive. The number of infected peaches was small and the loss was practically uniform throughout the orchard. The percentage of infection does not vary much between the different plats. Practically the only fruits infected had been broken open by hail during the latter part of June. Lacking the hail injury there would seemingly have been only a very slight development of rot.

No conclusions can be drawn concerning the control of curculio. The infestation was slight and rather evenly distributed over the plats.

Observations on the fruit in the portion of the orchard sprayed with self-boiled lime-sulphur showed that the control of scab, rot, and curculio had been practically the same as that in the dusted plats.

There was some foliage injury from the dust mixtures. This was quite noticeable in the plat dusted with the 90-10 mixture, and considerable defoliation resulted. The injury from the 50-40-10 mixture was only slight and approximated that caused by self-boiled lime-sulfur.

Experiments in the C. E. Blue Orchard

This orchard is located on newly cleared land, and the peach trees are planted as fillers in an apple orchard, there being three peach trees to every apple tree. Three varieties, Champion, Belle, and Elberta are included in the plats, which comprise a block of trees 32 rows long and 14 trees wide. Four plats laid out crosswise to the variety rows are included in this orchard, the same as in the Moomaw orchard. Each plat contains 128 trees, with the exception of the check, which is located on the windward side of the plats, and contains only one-half that number.

The treatment in this orchard was identical to that in the Moomaw orchard with the exception of one or two days difference in time of application. It should also be noted that the 85-15 formula was used for the third application on plat 2. This was due to the fact that it was impossible to secure the 90-10 material at the proper time for this treatment.

This orchard was dusted during the 1918 season as well as in 1919. Lime-sulfur solution was used as a dormant spray both seasons. It was noticed that a small amount of brown rot was scattered throughout the orchard at the time the Champion ripened in 1918, more particularly on the Champion and slightly less in a block of Carman that is located in another portion of the orchard. The weather was dry at this time and tended to check the spread of this disease, and the loss was inconsiderable.

Previous to the time the harvest records were made a survey of the plats showed that the condition of the fruit was very uniform within the plats. For this reason, it was decided to include the fruit from only a limited number of trees in each plat in the harvest records. The figures shown in table 3 are representative of the condition of the entire crop.

The Belle variety bore but few fruits, therefore, only the Champion and Elberta are included in the tables.

TABLE 3.—*Yields of peaches from dusting experiment in the C. E. Blue orchard.*

variety	plat	total peaches examined	number of fruits				per cent of fruits			
			sound	scab	rot	wormy	sound	scab	rot	wormy
Champion	1	682	309	0	361	12	45.3	0	53.0	1.7
	2	1115	611	1	498	5	54.8	0.1	44.6	0.5
	3	478	362	0	114	2	75.7	0	23.9	0.4
	4	1304	821	0	479	4	62.9	0	36.8	0.3
Elberta	1	3102	3035	2	42	23	97.8	0.1	1.4	0.7
	2	2452	2437	0	15	0	99.4	0	0.6	0
	3	2038	2033	0	4	1	99.7	0	0.2	0.1
	4	1402	1399	0	3	0	99.8	0	0.2	0

TABLE 4.—*Summary of results of dusting experiment in the C. E. Blue orchard. (The figures show percentage of infection.)*

Plat	Treatment	Champion			Elberta		
		scab	rot	wormy	scab	rot	wormy
1	Check	0	53.0	1.7	0.1	1.4	0.7
2	90-10 dust 3 applications	0.1	44.6	0.5	0	0.6	0
3	50-40-10 dust 3 applications	0	23.9	0.4	0	0.2	0.1
4	50-40-10 dust 4 applications	0	36.8	0.3	0	0.2	0

The striking feature of the work in this orchard is seen in the development of brown rot on the Champion. The continued wet weather during the entire season of fruit formation and maturity especially favored its development, and made the season an admirable one to test the efficiency of control measures.

The fact that the dust treatment failed to control brown rot satisfortorily is shown in tables 3 and 4. The percentage of infection on all three dusted plats of the Champion variety is very high, almost as high as the check plat. The efficiency of both dusting mixtures was low. The 90-10 mixture, plat 2, permitted 82.4 per cent as much rot development as occurred in the check, the efficiency being only 17.6 per cent, while the 50-40-10 mixture permitted 57.3 per cent (average of plats 3 and 4) rot development, the efficiency being 42.7 per cent.

The brown rot infection on the Elberta was slight, being only a little in excess of one per cent, even on the check. Although the Champion is more susceptible to this disease than the Elberta, this alone would not account for the great difference in the amount of rot on the two varieties. As stated previously, the presence of brown rot in the Champion block

had been noted during the preceding season and the excessive development is likely due in large measure to the accumulation of infective material. This entire orchard had been dusted during the 1918 season.

Unfortunately there was no spray plat provided in this orchard. A comparison of some value may be drawn, however, from results of spraying at the Agricultural Experiment Station orchard at Crozet. This orchard is in the same county as the Blue orchard, under practically similar climatic conditions, but with poorer air drainage. There is no Champion here but among other varieties are Carman and Early Crawford, the latter being fairly susceptible to brown rot. This orchard was sprayed with self-boiled lime-sulfur and only a small fraction of one per cent of the fruit was lost from brown rot. In the Blue orchard quite a number of the Carman was lost from this disease.

The amount of scab and curculio in the Blue orchard was negligible and no conclusions as to the efficiency of the control measures are warranted. The curculio injury as tabulated included only those fruits rendered unmarketable by this insect and therefore gives a truer indication of the damage caused by this pest than the figures from the Moomaw orchard.

There was no appreciable injury to the foliage or fruit from the dusting materials in this orchard.

Summary of Peach Dusting

The dusting materials gave entire satisfaction in the control of scab, but were of only slight value in the control of brown rot.

The curculio infestation was slight in both orchards and no conclusions as to the efficiency of the dusting materials for the control of this insect can be drawn.

The practical failure to control brown rot puts a decided limitation on the general usefulness of dust treatment in peach orchards. It seems established from these experiments and from those reported from other States that scab and curculio can be satisfactorily controlled by dusting, but this method appears to be unsatisfactory for the later applications for brown rot in Virginia orchards. The self-boiled lime-sulfur treatment has proven its worth in this connection.

EXPERIMENTS IN APPLE ORCHARDS

The original plan in the apple experiments included the testing of the dust method as a means to control codling moth and the several diseases common to the apple in this State, but more especially bitter rot since it is not evident that any particular dusting data are available in connection with the control of this disease.

For this purpose plats were located in the Mrs. Minnie W. Gentry orchard at Crozet, Virginia. Later observations brought to light a Ben Davis

orchard where the losses from blotch had been severe, almost immediately adjacent to the above mentioned orchard. Work was undertaken in this orchard which is under the management of Mr. Tucker Gentry of Crozet.

Experiments in the Mrs. Minnie W. Gentry Orchard

This orchard is located on fertile Porter's loam and only the Albemarle Pippin variety is included. The susceptibility of this variety to bitter rot is well known. The trees are approximately twenty-five years old and are very large. Although planted forty feet apart they now have practically filled all the space and many are thirty feet high. Bitter rot has been common in this orchard but during the past few years the control has been satisfactory from the use of three applications of Bordeaux mixture, the first being applied in early June, the second the latter part of June and the third in late July.

Five plats were under observation. The arrangement and treatment follows:

Plat 1—Check.

Plat 2—Bordeaux mixture 4-5-50 applied June 4, June 28, and July 25. Lime-sulfur and lead arsenate applied April 17.

Plat 3—Bordeaux dust, applied April 17, June 5, June 25, July 28 and August 8.

Plat 4—Same treatment as plat 2.

Plat 5—80-10-10 dusting mixture, applied on the same dates as plat 3. Each plat with the exception of the check contained 21 trees, being three trees wide and seven rows long. The check contained but 7 trees and was located on the outside of the orchard next to plat 2. It was originally planned to apply four summer applications of the dust but a heavy outbreak of bitter rot in July led to the application of a fifth.

Examination at harvest time indicated that a fairly uniform infection occurred within the plats. It was, therefore, decided to take the data from 10,000 apples per plat. After the data was secured from the check plat it became necessary to limit the count to approximately 6,000 apples per plat. The results of the counts, which include bitter rot, blotch and codling moth, are shown in table 5. No scab or black rot developed, and there was only a slight amount of sooty blotch. There is some duplication in the figures presented in this table. An apple found affected with two or more pests was recorded under each separate head.

TABLE 5.—*Yields of sound and unsound apples from the Mrs. Gentry orchard at harvest*

Plat	total apples examined	number of apples				per cent of apples			
		sound	bitter rot	wormy	blotch	sound	bitter rot	wormy	blotch
1	10072	574	9497	1648	275	5.7	94.3	16.4	2.7
2	6242	5458	784	75	14	87.4	12.6	1.2	0.2
3	6500	2094	4937	94	20	32.2	75.9	1.4	0.3
4	6100	5784	293	19	1	94.8	4.8	0.3	trace
5	6670	2448	4178	76	1	36.7	62.6	1.1	trace

Bitter rot was the only disease that developed to any appreciable extent in this orchard. A few infected fruits were noted after a careful examination on July 18, and within a few days a general outbreak had developed. The weather during July and August was very favorable for bitter rot infection which resulted in an almost total loss of fruit in the check plat, 94.3 per cent being affected at harvest.

The bitter rot control in the two plats (2 and 4) sprayed with Bordeaux mixture is considered very satisfactory in view of the severity of the disease and the fact that only three applications were made. At harvest 12.5 per cent of the fruit from plat 2 was affected, and 4.8 per cent of that from plat 4, the average being 8.7 per cent. It is believed that the amount of bitter rot in plat 2 was less than that indicated in the table and that the percentage calculated for plat 4 represents more nearly the true amount of infection that obtained in the sprayed portion of the orchard.

Both the Bordeaux dust and the sulfur dust proved very unsatisfactory from the standpoint of bitter rot control and the superiority of the liquid Bordeaux was very evident by comparison. There was no great difference in the amount of this disease in the two dusted plats: 75.9 per cent of the fruit being affected in the plat (3) receiving Bordeaux dust and 62.6 per cent in the plat (5) receiving the sulfur mixture.

The control of codling moth was remarkably good with both dust mixtures. There was practically no difference in the infestation in all four plats, none of them showing more than a little in excess of one per cent of wormy apples, while in the check 16.4 per cent were infested.

The harvest data on codling moth is supplemented by a record of the drops made on July 25. On the average about 2,000 apples were examined in each plat on this date. The following percentage of apples infested with codling moth was found: Plat 1—58.5; Plat 2—12.7; Plat 3—10.3; Plat 4—6.2; Plat 5—6.5. Here again the dust is shown to be fully as satisfactory as the liquid.

Referring again to the harvest data, the blotch infection was slight, amounting to 2.7 per cent in the check plat. The control was apparently almost perfect in the sprayed and dusted plats. In addition the examination of the drops on July 25 showed 4.4 per cent of the apples from the check plat affected with blotch while none was found in those examined from the other four plats. These results are not considered conclusive owing to the slight infection. They are significant, however, in conjunction with the blotch control obtained in the Tucker Gentry orchard.

The sulfur dust injured neither fruit nor foliage. The fruit in the plat receiving Bordeaux dust was slightly burned, but the only effect was an increased bronze color on the exposed cheek which enhanced the appearance.

Tucker Gentry Orchard

Only the variety Ben Davis is included in this orchard. The trees are over 20 years of age and of medium size. The work in this orchard was planned only with the view of investigating the effect of dust as a means of controlling blotch. Since blotch has only responded to Bordeaux mixture in spraying practice the sulphur dust was not included. Two plats were under observation, the one a check of five trees, and the other composed of eight trees receiving Bordeaux dust. The Bordeaux dust was applied in this orchard on the same dates as in the Mrs. Gentry orchard, namely, April 17, June 4, June 25, July 28 and August 8.

The control of blotch was very evident throughout the season and was remarkably illustrated when the harvest data was secured on October 14. At this time nearly all the fruit had dropped from the trees in the check plat. On the other hand the trees in the dusted plat retained practically their entire crop. Owing to the severe drop in the check, the number of fruits included in the table is rather limited. The counts were made on four of the trees in the dusted block and from all five of the check trees, every apple on the latter being examined.

TABLE 6.—*Yields of sound and unsound apples from dusting experiment in Tucker Gentry orchard.*

plat	treatment	number of apples			per cent of apples	
		total	sound	blotch	sound	blotch
1	Check	418	2	416	0.5	99.5
2	Bordeaux dust	613	589	24	96.1	3.9

No counts were made for codling moth and bitter rot in this orchard since blotch was the outstanding disease. Observations showed a moderate

amount of both with codling moth well controlled by the Bordeaux dust and bitter rot controlled to a slight extent.

The severity of the blotch infection in the check plat is especially remarkable. Of the 418 apples examined only 2 were not affected. An examination of the apples remaining under the trees at harvest and the observations during the season confirmed these results; all the drops seen were affected. The blotch fungus was well established on all the trees in this orchard and the crop had been a failure for several years from this source according to report.

The control of blotch obtained from the application of Bordeaux dust is very striking in view of these conditions. In contrast to the check, only 24 of the 613 apples examined in the dusted plat were affected, or 3.9 per cent as compared with 99.5 per cent. The severity of the infection was also less on the apples from the dusted trees. Many of those on the check were badly dwarfed and cracked while most of those on the dusted trees were only slightly blemished. The illustration (figure 1) shows two apples from the check trees as they appeared in mid season.

The most striking feature next to the blotch control was found in a comparison of the amount of fruit drop and the extent of defoliation between the two plats. At harvest not more than one barrel of fruit remained on the 5 check trees, while those in the dusted plat averaged approximately 3 barrels per tree. Observations in early summer showed little if any difference in fruit set and vigor of trees in the two plats.

Excessive defoliation occurred in the check plat. The trees were nearly bare on October 14 it being estimated that fully 75 per cent of the leaves had fallen. It is impossible to state how much of the defoliation was due to leaf infection by blotch and how much to frog-eye, but both undoubtedly contributed in the result. The trees in the dusted plat in contrast retained fully 90 per cent of their maximum foliage at this time, and the leaves were strong and of good color. It was noted that the two check trees bordering the dusted plat retained more leaves than the other check trees, this being especially evident on the side next the dusted trees. Evidently the dust had reached these trees in sufficient amount to moderate the severity of the leaf infection. The local action of the dust on partially covered trees was also noted on two trees in the dusted plat. These trees are near a shed which permitted application from only one side. There was considerable blotch on the fruit and increased defoliation on the side that did not receive direct dust application. Throughout the dusted plat there was more blotch on the fruit borne on the lower inner parts of the trees.

The striking difference in amount of defoliation on the check and dusted trees is attributed to the prevention of leaf infection by the Bordeaux dust.

The heavy fruit drop from the check trees is in turn attributable chiefly to the defoliation resulting from leaf infection, and the retention of fruit on the dusted trees to the prevention of leaf infection. Some of the drop was due to codling moth but this was of minor importance.

The Bordeaux dust russeted some of the apples to a considerable extent, a very few being severely dwarfed and deformed. The injury as a whole, however, was of no commercial importance.

Summary of Dusting Experiments on Apples

Both dust mixtures gave satisfactory control of codling moth, the degree of control being practically the same as that obtained with the liquid spray. This is in agreement with the results of a number of investigations in other States, and is also confirmed by experience in commercial work. It seems well established that dusting is a satisfactory method of combatting this insect.

From the standpoint of bitter rot the results from dusting were decidedly unsatisfactory. The Bordeaux dust was no better than the sulfur dust mixture in this respect and both were little better than no treatment at all. The development of rot in the two dusted plats amounted to almost a total loss of fruit since none of it could be barrelled owing to the probable breakdown in transit and storage. The standard Bordeaux mixture treatment on the other hand gave a satisfactory control of bitter rot in view of the severity of the infection and the unfavorable season. It is apparent that neither of the dust mixtures in their present form can be generally recommended for summer application in orchards where bitter rot is a factor.

The excellent control of blotch on the Ben Davis apples was as striking as it was unexpected. This disease which is generally considered one of the most difficult to combat was almost completely prevented by the application of Bordeaux dust. Infection was very prevalent in the check plat, and the test was a severe one.

Leaf infection caused by both blotch and frog-eye was almost entirely prevented by the Bordeaux dust. Defoliation and subsequent fruit drop in the check was almost complete, while the dusted trees retained both foliage and fruit.

We do not consider these results, even though they show a most excellent control of blotch, an unqualified recommendation for the use of Bordeaux dust. A material for general orchard use must be effective for all diseases likely to occur. Bitter rot infection follows blotch very shortly under Virginia conditions and a material that will not prevent bitter rot can have only local use, especially when its use necessitates duplication

of equipment. Bordeaux mixture has proven its worth in the control of both bitter rot and blotch. However, these results seem promising, and it is possible that dust materials suitable for general orchard purposes will be developed in time. Meanwhile the fruit growers should, in our opinion, retain the methods and materials of proved value.

Figure 1.—Ben Davis apples affected with blotch.

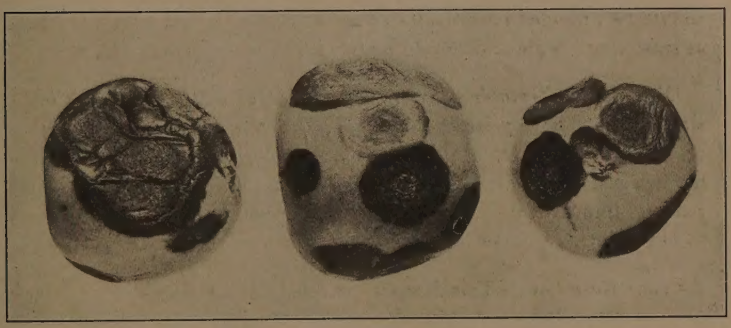

Figure 2.—Bitter rot as it appears on the fruit. The variety shown is Banana.

NOTE TO FRUIT GROWERS CONCERNING CEDAR RUST

Heavy Losses.—The losses from Cedar Rust this year were the greatest known in the history of apple growing in Virginia. They are estimated at one million to one and one-half million dollars.

York Imperial.—This is the most susceptible large commercial variety, and most of the loss was sustained in York orchards. Many of these had no Yorks suitable for barreling, and many tons of apples which would have gone in barrels, except for Cedar Rust, had to be sold for cider stock.

Red Cedar a Public Nuisance.—The red cedar tree is an undesirable neighbor for an apple orchard. It was declared a public nuisance by the Virginia Legislature in 1912. The Cedar Rust disease on apples comes directly from the red cedar tree. Spores from the cedars are blown to the apples by the winds in spring and cause the well known spots on leaves and fruit. If there were no red cedar trees there would be no Cedar Rust on apples.

The Remedy.—The remedy lies in the removal of all red cedar trees from the vicinity of apple orchards. A zone free from cedars should be provided on all sides of the orchards. The zone should be at least a mile wide and should be two miles wide, if possible.

Difficulty in Removing Cedars.—The cost of cutting cedars is insignificant in comparison with the benefit obtained. The difficulty usually lies in getting permission to cut cedars on land adjacent to the orchard. Most cedars are of little value in Virginia, and their removal improves the land. When it is impossible to get permission to cut cedars, recourse may be had to the law.

Cedar Rust Law.—This law was enacted by the Virginia Legislature in 1912. It provides for the legal cutting of cedars within one mile of apple orchards. It is a local option law and must be adopted by the board of supervisors before it can be put in operation in any county or magisterial district. Information concerning this law may be obtained from the Crop Pest Commission at Blacksburg.